Problem 8.1

(a) Derive labor-demand curve based on the labor production function (You can find the answer from Figure 8.1 in the textbook):

(b) The effect of a technological progress on labor demand (You can find the answer from Figure 8.2 in the textbook):
(c) The effect of a decrease in real wage rates on labor demand:

A decrease in real wage rates from \((W / P)_0\) to \((W / P)_1\), causes the quantities of labor demanded to increase from \(L_0\) to \(L_1\). It is the movement along the labor demand curve.
Problem 8.3

Raising the standard deduction by $1,000 implies that disposable income increases for every one. Recall that leisure is a normal good, which means that more leisure is consumed (i.e., people work less) when income increases. Also, income effects are likely to be small for poor people and, possibly, greater for richer people. As a result, the tendency would be for an increase in the standard deduction to reduce the supply of labor, but probably by very little for the poorer workers and perhaps noticeably for richer workers.

Problem 8.4

An increase in the marginal rate of taxation reduces the after-tax real wage, which can be regarded as a reduction in the price or opportunity cost of leisure. With any price decrease, there is both an income and a substitution effect. The substitution effect implies that, since leisure is now less expensive, people will buy more of it. That is, they will work less. But there is also an income effect. The reduction in the after tax real wage, is a reduction *ceteris paribus* in income. If leisure is a normal good, a reduction of income means that people will buy less leisure – that is, they will work more. So, the income effect here at least partly offsets the substitution effect. At low levels of income, we would expect income effects to be small, so that the net effect is that an increase in taxes would reduce labor supply. For richer people, income effects are likely to be greater, so that it is possible, but not certain, that they would supply more labor; but, in any case, the income effect will offset more of the negative substitution effect, so that any negative effect on labor supply would be smaller.

Shaded areas are NBER recessions.
Problem 8.9

The question calls for a conjecture, which will vary from student to student. Here is one: The fall in male participation rates, while overall participation rates are rising, implies that female participation rates are rising. This could be the result of greater opportunities for women. And more women in the workforce – if they are associated in families with men – allows men to participate less as women offset some of the lost income. Chart 1 shows participation rates for men, women, and teenagers. Chart 1 confirms the conjecture. Female participation rates rose steadily over the whole period – though especially quickly between the 1960s and the 1990s, while male participation rates fell – especially steeply from the 1960s. Teenage participation rates have fluctuated decade to decade, but without a strong long-term trend. Other factors that might contribute to the pattern of rising female participation rates are: 1) the end of the baby boom: with fewer children on average to take care of, more women moved into the work force; 2) changing attitudes toward childcare – either fathers became more willing to share child care – or child care providers other than parents became more acceptable, freeing women to move into the labor force; 3) later average age of marriage; 4) rising expectations for consumption, encouraging more women to work to boost family income; 5) better education for women. Men may have been affected in the opposite direction by some of these factors. In addition, improvements in pension and retirement arrangements may have made it possible for men to retire earlier, lowering participation rates. Overall, the negative trend in men’s rates has been more than offset by women’s rates, leading to a net increase in participation rates.

Problem 8.10

Movements in participation rates are dominated by longer-term trends. However, looking at Chart 1, we see women’s participation grew more slowly or even fell in every recession after about 1960 than in the period immediately before or after the recession. The pattern is less clear for men. But in fact, in a number of recessions, it appears that men’s participation rates fall more steeply than the trend. This suggests that for both men and women recessions tend to be a downward force on participation rates. Where, for women, it is offset by the rising trend, for men it reinforces the falling trend. If a man is going to drop out of the labor force, the onset of a recession is a particularly good time to do it. Teenage participation rates do not show a long-term trend. They start in the 50-50 percent range in the 1940s and drop to about 45 percent in the mid-1960s. This may reflect fewer teens dropping out of high school. From the mid-1960s they rise sharply to a postwar peak in the mid-1970s of a little under 60 percent. This probably reflects widespread engagement in part-time employment. From the peak, they fall in a series of cascading steps, each including a beg step down during a recession, so that recent data put the rate near the 1950s low point. The pattern of rates falling in recessions is very clear. Looking ahead to Chapter 9, Figure 9.7, which shows the real minimum wage rate, there is an extremely rough similarity between the real minimum wage, which would be relevant for many teens, and teenage participation rates: both rise into the 1970s and fall thereafter. Other reasons for the fall might include higher family incomes, meaning teens
needed to work less, and more teens continuing into tertiary education. The high variability of teenage participation may reflect the fact that teenagers are very flexible to enter into and leave the job market because they are not necessary to support the family; it is hard for the teenagers for find a job during the recessions; most teenagers choose to work during summer vacations.

Problem 8.12

\[ A = 8.15; \ L = 236,882 \text{ million worker hours per year}; \ K = \$19,317 \text{ billion} \]

\[ Y = 8.15 L^{0.69} K^{0.31} = 8.15 \times (236,882 \times 10^6)^{0.69} \times (\$19,317 \times 10^9)^{0.31} = \$7,554.85 \text{ billion} \]

(a) \[ w/p = mpL = \alpha \times \frac{Y}{L} = 0.69 \times \frac{7,554.85 \times 10^9}{236,882 \times 10^6} = \$22.01 \text{ per hour} \]

\[ \frac{(w/ \ p)_1}{(w/ \ p)} = \alpha \times \frac{Y}{L_1} = \frac{AL^{0.69} K^{0.31}}{L_1} = 0.69 \times \frac{A(1.01)L^{0.69} K^{0.31}}{(1.01)L_1} \]

\[ = 0.69 \times \frac{8.15 \times (1.01 \times 236,882 \times 10^6)^{0.69} \times (\$19,317 \times 10^9)^{0.31}}{1.01 \times 236,882 \times 10^6} = \$21.94 \text{ per hour} \]

Thus, the real wage has to decrease by $0.07 per hour ($22.01 per hour - $21.94 per hour) – about 1/3 percent – to justify an increase of 1 percent in the total number of hours employed.

(b) \[ (w/ \ p)_1 = \alpha \times \frac{Y}{L_1} = \alpha \times \frac{AL^{0.69} K^{0.31}}{L_1} \]

\[ = \alpha \times L_1^{0.31} \frac{AK^{0.31}}{(w/ \ p)_1} \]

\[ = \sqrt[0.31]{\alpha} \times \frac{AK^{0.31}}{0.31} \times \frac{AL^{0.69} K^{0.31}}{1.01(w/ \ p)} \]

\[ = \sqrt[0.31]{0.69 \times 8.15 \times (\$19,317 \times 10^9)^{0.31}} \times \frac{1.01(22.01)}{101} = 229,268 \text{ millions} \]

Thus, the hours of labor would decrease by 7,614 millions per year (236,882 millions – 229,268 millions) if the real wage increased 1 percent – a fall in labor of about 3 percent.
(d) \( \frac{w}{p} = \alpha \frac{Y}{L} = 0.69 \times \frac{8.15 \times (1 + 0.01) \times (236,882 \times 10^6)^{0.69} \times (19,317 \times 10^3)^{0.31}}{236,882 \times 10^6} = 1.01 \times \frac{7,554.85 \times 10^9}{236,882 \times 10^9} = \$22.23 \) per hour

Thus, the real wage would increase by \$0.22 per hour \((22.23 - 22.01)\) if total factor productivity increased by 1 percent holding hours constant – and increase in real wage rates of 1 percent.

(e) As in (c) above, if \( \frac{w}{p} = \alpha \frac{Y}{L_1} = \alpha \frac{A_L L_1^{0.69} K^{0.31}}{L_1} = \alpha \frac{A_L K^{0.31}}{L_1^{0.31}} \); then

\[
L_1 = 0.31 \sqrt[0.31]{\frac{\alpha A_L K^{0.31}}{(w/p)}} = 0.31 \sqrt[0.31]{\frac{(1.01) A K^{0.31}}{(w/p)} = \sqrt[0.31]{0.69 \times \frac{(1.01) \times 8.15 \times (19,317 \times 10^3)^{0.31}}{22.01}} = 244,469 \text{ millions}
\]

Thus, the hours of labor would increase by 7,587 millions per year \((244,469 \text{ millions} - 236,882 \text{ millions})\) if total factor productivity increased by 1 percent holding real wage constant – about 1 percent.
Problem 9.1

(a) The unemployment rate for 1996 = \( \frac{LF - EMP}{LF} \) = \( 1 - \frac{EMP}{LF} \) = \( 1 - \frac{8,344 \times 10^3}{9,127 \times 10^3} \) = 8.58 %

The participation rate for 1986 = \( \frac{LF}{POP} \) = \( \frac{7,588 \times 10^3}{16.02 \times 10^6} \) = 47 %

(b) The value of the employment index in 1989 = \( \frac{7,720 \times 10^3 \times 100}{6,974 \times 10^3} \) = 110.7

Problem 9.2

The amount of labor supplied falls short of the amount of labor demanded when the minimum wage is set above the market-clearing wage, resulting in unemployment. But this amount of unemployment depends on the steepness of the labor supply and labor demand curves. As shown in the figure, when the labor supply and labor demand curves are steep (Recall that demand and supply are less elastic in the short run), the amount of unemployment is \( (L_D - L_S) \); when the labor supply and labor demand curves are flat (Recall that demand and supply are more elastic in the long run), the amount of unemployment is \( (L_D' - L_S') \). As we can see, \( (L_D - L_S) < (L_D' - L_S') \). This simple analysis might tell less than the whole story about minimum wage increases because the portion of workers who work for the minimum wage is small in the economy. As a result, the actual effect on the amount of unemployment due to increase in the minimum wage might be smaller than that in our simple analysis.